MARSHALL

AR-300 TAPE ELIMINATOR™

OWNER'S MANUAL

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APPLICATION.....

This unit was developed to do just what the name suggests: replace or eliminate the need for that mechanical tape recorder in all applications making use of inter-head delay.

The delay element itself exhibits all of the desirable characteristics of tape, and overcomes the obvious limitations.

The following performance parameters are retained from tape and designed in to your AR-300 TAPE ELIMINATOR:

1: NAB EQUALIZATION CURVE BUILT IN
2: H.F. E.Q. TRIM FOR EACH TAPE SPEED
3: CAPABILITY TO OVERBIAS BY 3 dB PLUS
4: NO HARD CLIP: EXHIBITS TAPE SQUEEZE
5: TYPICAL TAPE DISTORTION CHARACTER

The following limitations of tape have been overcome with your TAPE ELIMINATOR:

1: POOR DYNAMIC RANGE; 65 to 70 dB:
AR-300 EXHIBITS BETTER THAN 105 dB.

2: LIMITED HEADROOM; TYPICALLY 10 dB:
AR-300 EXHIBITS BETTER THAN 25 dB.

3: LIMITED VSO RANGE; ± 25 % TYP.:
AR-300 OVERLAPS INTO NEXT SPEED.

4: RADICAL H.F. E.Q. SHIFT WITH VSO:
AR-300 LIMITS SHIFT TO ± 2 dB.

5: TAPE DICTATES T.H.D. ORDERS:
AR-300 GIVES CHOICE OF EVEN OR ODD.

6: LARGE SIZE AND NEEDS MAINTENANCE:
AR-300 IS 1-U TALL; NO MAINTENANCE.

INTERFACING.....

YOUR AR-300 TAPE ELIMINTOR was delivered with an outboard power supply unit. This system is used to maximise dynamic range.

The power supply has a ten pin edge connector already installed. Pins 5 through 10 are pre-wired to the unit for power, while pins 1 through 4 are left open for audio connections.

There is a red dot at one end of this connector. This marks pin 1 and must be matched to the pin 1 red dot marker on the TAPE ELIMINATOR.

UNBALANCED.....

If you ordered your unit UNBALANCED, the interface pinout is as follows:

PIN 1.....OUTPUT GROUND
PIN 2.....OUTPUT HOT
PIN 3.....INPUT GROUND
PIN 4.....INPUT HOT

When your UNBALANCED unit is interfaced as listed above, it will operate at unity gain when the input level control is in the = (unity) position.

NOTE: It is sometimes necessary in applications where complex patch bay wiring may be causing ground looping complications to float (not connect) the ground side of the output lead at the effects unit; tying it to ground only at the other end.

BALANCED.....

If you ordered your unit BALANCED, the interface pinout is as follows:

PIN 1.....OUTPUT COLD; LOW
PIN 2.....OUTPUT HOT; HIGH
PIN 3.....INPUT COLD; LOW
PIN 4.....INPUT HOT; HIGH
PINS 5&6..SHIELD GROUNDS

PINS 5 AND 6 ARE INTERNALLY TIED.

When your BALANCED unit is interfaced as listed above, AND USED AND PATCHED IN FULL BALANCED CONFIGURATION, it will operate at unity gain when the input level control is in the = (unity) position.

NOTE: It is sometimes necessary in applications where complex patch bay wiring may be causing ground looping problems to FLOAT (not connect) the SHIELD of the output or input (or rarely, both) leads at the effects unit; tying it to ground only at the other end.

USE.....

The AR-300 TAPE ELIMINATOR applications are obvious; here are the details.

It is essentially impossible to clip this unit. After you have exceeded nominal zero, the 20 dB displayed on the headroom indicator bar comes into effect. After the red led is turned on you still have additional room which will exhibit increasing "tape Squeeze" characteristics.

The "tape squeeze" or physical tape compression characteristics of the AR-300 TAPE ELIMINATOR are real, and can be used purposely in exactly the same way as you would use this effect on tape.

The results will be the same, including differences for each tape speed.

The three TAPE SPEEDS (RANGE-mS) are:

RANGE A: GREEN; 20-75 mS; X1.....30 IPS

RANGE B: YELLOW; 40-150 mS; X2....15 IPS

RANGE C: RED; 80-300 mS; X3.....7.5 IPS

The VSO (TIME DELAY) control will fully overlap into the next tape speed with no problem. The normal operating position varies from customer to customer, depending on what brand of tape recorder you are replacing and what it's physical inter-head delay times were.

The twelve o'clock position of this control is roughly the center of the available delay range. However, the range in the area of 40 to about 70 is where most inter-head delays that are popular are found.

The popular 160 to 175 mS. tape slap is found at around the 50 mark on the VSO (TIME DELAY) control in RANGE C.

This delay device is extremely flat, so you can control feedback characteristics very accurately when using the unit for repeat (soft) tape echo.

A boost of just one or two dB within the passband will clearly cause the echo tail to gravitate towards that "pitch".

You will find it nice to have that kind of control. Even that thin Revox echo tail can be duplicated easily, for those who might miss it.

THEORY, DESIGN CONCEPT, AND HISTORY.....

Your AR-300 TAPE ELIMINATOR was developed over a period of four years in response to demands for a true electronic replacement for the ubiquitous mechanical tape recorder.

Some of the industries best technicians and engineers from world class studios have been asking for the development of this device for years. Though we would have been more than happy to comply immediately, technology had not yet reached the point that would make that possible.

In fact, this turned out to be a much more involved project than originally anticipated; for many reasons.

First of all, it is not possible to simulate the desirable factors (or side effects) of the tape recording process with tricks such as frequency dependent compression thresholds and complex non-linear amplifiers. These attempts to copy the "fat" or "soft" characteristics which tape exhibits when pushed into its

non-linear region just don't work.

Further, attempts to control dynamic or steady state distortion characteristics artificially to emulate the dominant even order products (that can make tape sound so good) proved to be a joke.

Digital technology was also out of the question, as the whole idea was to recreate the softer, harmonically related characteristics of tape.

Problems such as disastrous noises resulting from even short transients clipping, dominant side band distortion products, increasing distortion as signal levels approach either maximum or minimum amplitudes, and quantizing error all contribute to the "harsh" or "cold" sound that has often come to be associated with digital delay lines.

The twelve (or even fourteen bit) resolution offered by the best digital delay lines today just isn't enough to overcome these problems to the good ear.

While the sixteen bit PCM recording systems deliver a shockingly good dynamic range in the nineties, sixteen bits seems to be right on the edge in terms of musical performance: some people say the sound is very good, while others feel that it is still too "edgy".

While a real dynamic range in the nineties is an obvious improvement over analog tape recording, the actual "sound" of these systems is questionable to many, so even a sixteen bit digital system proved unsuitable for our "TAPE ELIMINATOR" goal.

Remember: there is a reason for the race for more and more bits in digital audio systems: the higher the number of bits per word, the higher the resolution. This means that as the number of bits per word approaches infinate; it is, by definition, approaching analog.

This confirmed our original thoughts that the basic system concept must be built up around a fully analog delay element, with tha audio signal never digitized (quantized) at all.

After a long period of studying which factors of the tape recording process were desirable and why, we had to define technically what they were.

We then began research targeted at the development of a new delay element which actually exhibited these desirable characteristics inherently.

We knew that the delay element itself must naturally have the desirable characteristis of the tape that it was eliminating. Approximation of these subtle and fragile factors by additional circuitry was inferior to say the least (hopeless to be more accurate).

Further, the system must not suffer from clearly undesirable tape characteristics such as limited dynamic range, poor headroom, and severe VSO E.Q. changes.

Finally, after several years of work in the area of LSI silicon junction transfer efficiency the breakthrough came, and our newest delay chip was born.

The first prototypes of the new delay line elements were field tested and then produced in reasonable quantities. Some of these were installed in packages designed for A&R recording studios and sent out for on- line evaluation and further evolution.

Following a period of interactive developement involving A&R Studios, Marshall Electronic, Marshall's twenty-four track facility, a few very good independant engineers and other Golden Ears, the AR-300 TAPE ELIMINATOR design was frozen.

The first several production runs of the device were shipped against previous commision (A&R being the first; hence the name AR-300), and then the device was added to the Marshall product line.